

## Price List

### ULTRA-FIDELITY KARLSON 15

15B -Blond Karlsonite for 15" Speakers.....	\$117.60
15M Mahogany Karlsonite for 15" Speakers.....	117.60
15BG Model 15B with Full Grille Cloth Front.....	117.60
15MG Model 15M with Full Grille Cloth Front.....	117.60
15CF Hand Finished Custom Made Karlson*.....	150.00
15CU Unfinished Custom Made Karlson*.....	135.00
15PU Unfinished 15" Plywood Assembled unit.....	65.00
15PK Self-Assembling 15" Plywood Kit.....	45.00
12A Adapting Board for 12" Speaker.....	1.50
10A Adapting Board for 10" Speaker.....	1.50

### KARLSON 12

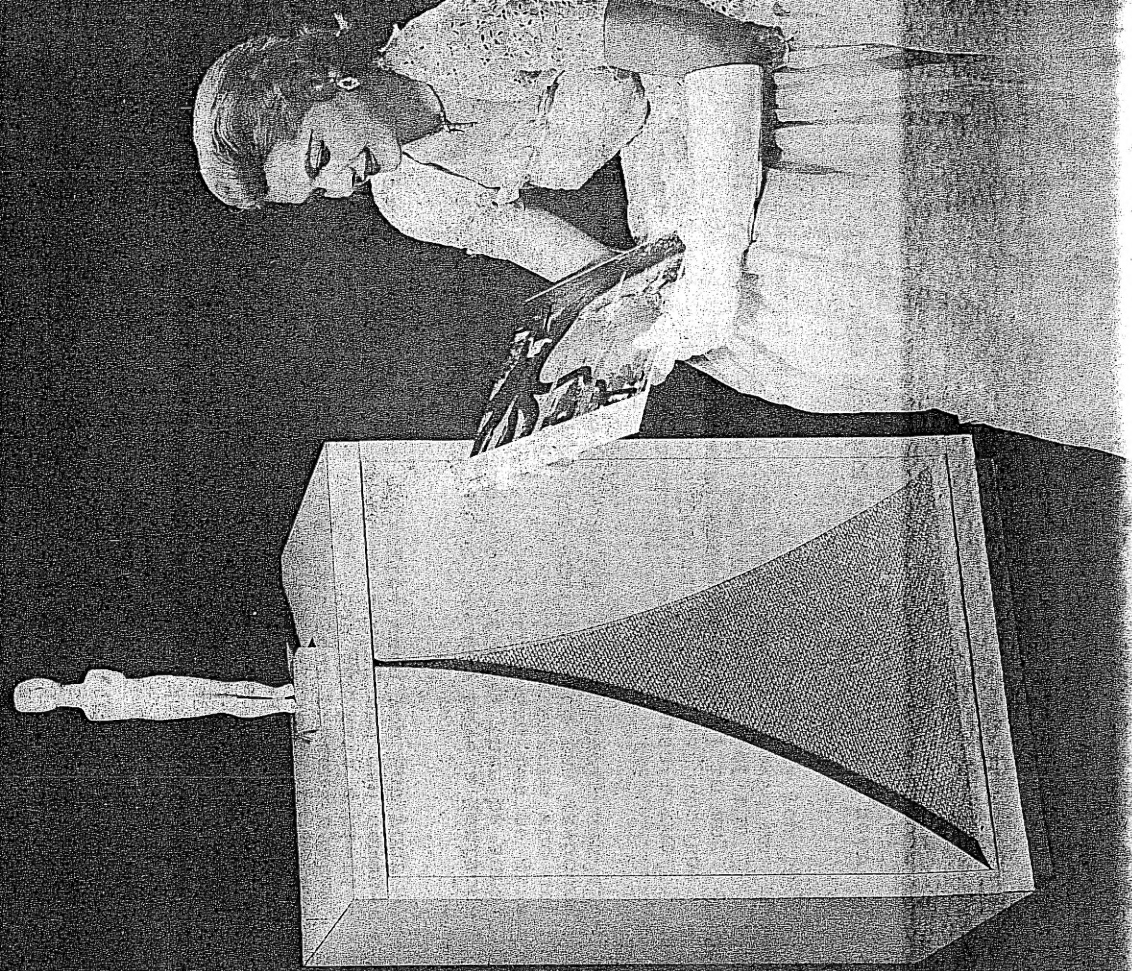
12B Blond Karlsonite for 12" Speakers.....	\$ 99.60
12M Mahogany Karlsonite for 12" Speakers.....	99.60
12BT Blond Karlsonite Tray for 12B.....	14.95
12MT Mahogany Karlsonite Tray for 12M.....	14.95
12PU Unfinished Assembled 12" Plywood.....	55.50
12PK Self-Assembling 12" Plywood Kit.....	37.50

\*Please specify wood desired: Pine, Walnut, Oak, Mahogany, Birch, or Korina. Custom made units may be had either with the regular Karlson curved front design or with a full grille cloth front design.

The Karlsonite models have beautiful wood finishes which are protected against damage by a thick plastic layer so they will stay new for years. This is the last word in up-to-date finishes....protects your enclosure against stains, rubs, burns and children.

SEE AND HEAR THE KARLSON AT:

# The Karlson Enclosure



## INTRODUCTION (of sorts)

This booklet is designed to unfold the story of the Karlson Enclosure for both seasoned and unseasoned audiophiles.

As you may have surmised by now, the Karlson is not merely another type of speaker enclosure: it is an invention that has set the entire high fidelity industry on its ear. Just a bit over two years ago John Karlson and I started out with a rented dado cutter and enough wood for four enclosures as our total assets....today we have six factories manufacturing Karlsons for us. This growth is due to one thing only: the Karlson is terrific! Everything has already been claimed by other manufacturers so we have had to prove to corps after corps of hard-bitten skeptics that the Karlson actually does more than we advertise. One measure of our success in this is the growing use of the Karlson Enclosure as a reference standard in labs. Another is the number of top men in the industry that have a Karlson in their own home.

The essence of the next 30 pages is this: you will actually save money, a lot of money, if you select a Karlson Enclosure for your hi-fi system. For \$117.60 (or as low as \$37.50) you can have an enclosure that cannot be approached in performance by anything else yet devised. Even the cheapest of speakers are transformed when they are used in the Karlson. It is easy to hypnotize yourself into thinking that your present system does, after all, sound not too badly. You can have a hi-fi system that you can be really proud of owning and can demonstrate to your friends without apologies when you get your Karlson.

You should by now have a friend or two who have a Karlson and are pressuring you to get one too. If not, then be sure to stop in for a visit at the next audio show and let me give you the "works" from tropic drums to violins. Anyone who has been to an audio show remembers our exhibit with the ka-boom-ka-boom-ka-boom of the drums shaking the whole hotel, and all from one little Karlson Enclosure.

Performance is of course important, but that isn't the only reason why you should get a Karlson. Consider too the beautiful design of the enclosure which looks well in any type of living room, the beauty and practicalness of the plastic finish which cannot in ordinary use be damaged or stained, and the small size of the unit which allows you to fit it in anywhere.

I hope you will enjoy reading this booklet. May I hear from you if you have any questions not covered here? May I also hear from you after you have had a chance to get your Karlson and try it out?

Wayne Green  
General Manager

The Karlson Enclosure is patent pending.

This booklet Copyright 1955 by Karlson Associates, Inc.

Pursuing our clever plan of letting Convinced Authorities talk for us here are some comments reprinted from an article by Joseph Marshall in the January 1955 Radio-Electronics, copyright 1955. Reprinted here by the kind permission of Radio-Electronics.

### The Karlson enclosure

The biggest and toughest obstacle to complete fidelity in most hi-fi systems is the inability of the speaker system to reproduce the lowest octave and a half—from 16 to 40 cycles—of the musical spectrum. Many expedients—some quite heroic—have been worked out for extending speaker response downward to include this last octave. Lately we have had many efforts to do the job with relatively small enclosures. A novel and successful one is the Karlson which, though only 34 x 24 x 15 inches in outside dimensions, claims and (to cut the suspense) can in fact deliver a response down to 16 cycles with a suitable loudspeaker.

The Karlson could be called a wide-band resonator. It employs an air column as a resonant element. Air columns, however, though very efficient (as the pipes of a pipe organ can prove) have some bothersome properties. They are resonant when their length equals a quarter wavelength, but at higher frequencies they behave in a way very comparable to the behavior of a transmission line—or particularly a stub. Thus a column open at one end produces a strong fundamental and odd harmonics; but the reflection from the open end at frequencies for which the column is a half wavelength, or a multiple of a half-wave, is out of phase and results in cancellation—exactly as in a shorted stub. The over-all response curve is as in *a* of Fig. 2.

Mr. Karlson says that if the column is given a lip or slot at the open end, the peaks are broadened, as in *b*. If the slot is continued for more than two-thirds the column length and given an exponential shape, the result is a flat wideband response as in *c*.

Readers who examine the Karlson enclosure will be hard pressed to see any resemblance to a column or pipe, and it is the harder to recognize since Mr. Karlson has also employed the

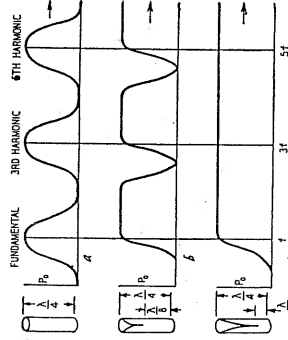


Fig. 2—Action of notched organ pipe.

reflex principle to increase efficiency further. The result is an enclosure of quite complicated structure but one which does a spectacular job on the bass.

I have had a Karlson on test for a couple of months and have tried it with speakers in just about every price range. Whether or not, as Karlson claims, it beats a 30-foot horn I could not determine, having no desire to build a 30-foot horn. But certainly it can put out an amazing bass, completely out of proportion to its size and far beyond the design capacity of the speaker used.

The degree to which the last octave is covered will depend, of course, on the speaker—the lower its resonance, the flatter the response below 40 cycles. Every speaker seems to deliver from a half to a full octave more range than one would imagine from the speaker specifications. The RCA LC-1A and the older 515S2 both have resonance in free air of between 45 and 50 cycles. Both, in the Karlson enclosure, give a response down to 20 cycles which contains a large and dominant component of fundamental. In an infinite baffle both cut off severely below 30 cycles.

Actually, what surprised me most was, not the performance with fine speakers, but what it did with inexpensive ones. For instance, I stuck a prewar Cineaudograph of the PA type in it and the result was a startling bass. The medium-priced SL-12 (RCA) produced an exceptional over-all frequency response and a very smooth one. This suggests that those who can, or must, let their systems improve with time, might consider purchasing a Karlson enclosure in kit form for use initially with an inexpensive speaker.

A fine characteristic, not shared by all speaker systems, is that it delivers excellent bass response at very low levels. Aside from the tremendous bass response, it has a very individual character easily and readily recognizable. First, the slot spreads the point source so that the orchestra fills the room more, so to speak, instead of seeming to be in the next room and audible through a small hole in the wall. This is all to the good.

However, there is another effect which some will like more than others. It is what Mr. Karlson describes as "controlled ring time." Rather difficult to describe in words, it is definitely not cavity resonance nor really hangover. It might be called "built-in reverbation." In most rooms and to most ears, the result is a rather spectacularly improved feeling of presence.

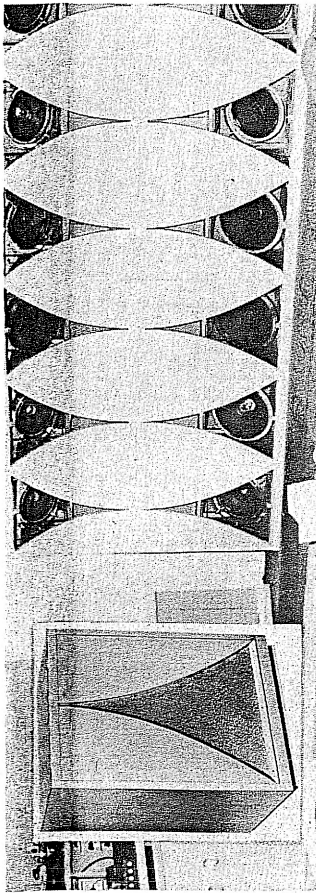
The speaker, not at all critical as to placement, can be put anywhere in a room. The bass response is not dependent on use in a corner. I suppose it could be put in a corner though I shudder to think what the resultant bass would do to the listener's ears.



# Reprinted from

# HI-FI manual

by Donald Carl Hoefler



Karlson Enclosure, inset left, is used by Hudson Radio's Newark, N. J., store for comparing 12 speakers.

## Enclosures and Cabinets

**Essential for high fidelity of sound, the loudspeaker housing shapes sound waves to give least cancellation and the truest bass response.**

**T**HE cabinet which houses the loudspeaker may also contain other units of the high fidelity system, and it may be a decorative piece of furniture, but above all it must act as a *baffle* for the speaker system.

Any direct-radiator produces actually two sets of sound waves simultaneously, for at the same time that the molecules of air in front of the cone are being compressed or rarefied, a similar but opposite action is taking place at the rear. The two waves are then said to be 180° out of phase, and when they are permitted to meet there will be a partial cancellation of the opposing pressures, an effect which is more pronounced at the long-wavelength bass end of the audio spectrum. In order to effect good low frequency response in a speaker, then, it is necessary to include some means of preventing this back-to-front cancellation.

### Flat Baffles

The simplest means of doing this is by the use of a *flat baffle*, which is simply a board with a hole in it, against which the speaker is mounted. The back wave must then travel out to the end of the baffle and turn around to the front before it can cause any interference. In order to avoid this effect completely, then, the flat baffle would have to be infinitely large. The closest practical approach to this condition is reached when the speaker is mounted in a wall

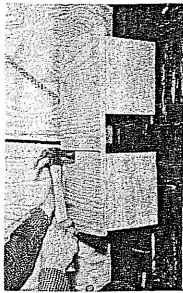
between two relatively large rooms. This system has the advantages of simplicity, freedom from cabinet resonances, and saving of floor space.

A more practical form of the flat baffle is obtained when the edges have sides attached to them at right angles, thereby forming an open-backed box. But this method, which is the type often utilized in commercial radios, sets up its own sympathetic low-frequency vibrations, causing an unnatural booming bass response.

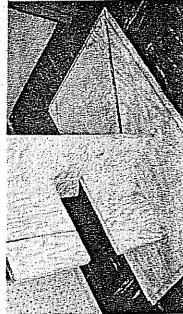
Closing off the back returns us to the idea of the wall-mounted infinite baffle, with the large room to the rear being replaced by a small box. As the dimensions of the enclosure decrease, however, the natural resonant frequency of the speaker is increased, which once again causes booming bass and very poor response below the resonant frequency.

### Phase Inversion

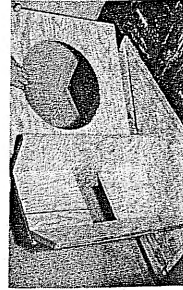
At this point we might inquire if the back wave could be useful to us if it could go through some sort of phase inversion process, and then ultimately appear in phase with the front wave so that it would add to it. This could be done if our baffling inserted a time delay of just the right period, and since the velocity of sound is constant, the time delay could be determined by the length of the back-to-front path. But the wavelength of sound varies with its frequency, so that the phase re-



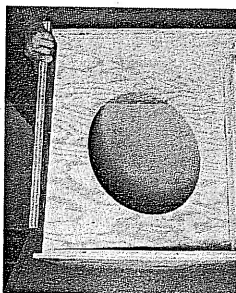
Supplied in both completed form and in pre-cut plywood kits is the Karlson enclosure.



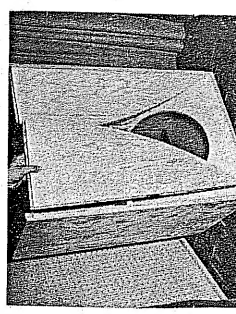
Hammer, clamps, nails, and glue are all that is needed to assemble the pre-slotted pieces. Heavy plywood is material used.



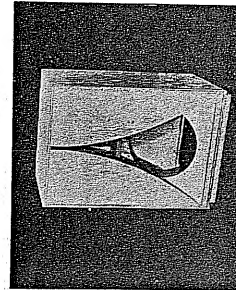
Loudspeaker mounting board is set at angle for radiation of sound waves.



All parts must be glued as well as nailed. Reproduction of a full orchestra builds up large pressures inside the speaker baffles.



Kit can be finished with paint or veneer. Ready-made units use Formica.

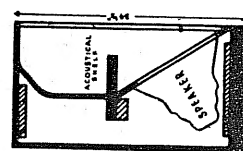


lationships would also vary with frequency for a given period of time delay. In practical phase inverters, then, the time delay is chosen for an in-phase reinforcement of the normally deficient bass frequencies, while at the same time absorbent material in the cabinet damps out the higher tones which might cause cancellation effects or undesirable peaks.

One practical form of the phase inverter is the *acoustic labyrinth*, an old idea which has been dusted off and is achieving renewed popularity. As its name implies, it is a series of baffles which provides a "mystic maze" pathway for the low frequency back wave resulting in an in-phase bass boost. This system had fallen out of favor only because of its relatively complex construction, but since so many of today's designs are even more complicated, this one is showing signs of a real comeback.

### The Bass Reflex

If we cut a small port or vent in the front of our fully-enclosed box, we then have the beginnings of a tuned box or *bass reflex* enclosure, which is another form of phase inverter. This system cuts off about an octave above the labyrinth characteristic, but it has the advantage of unusually good bass response for so small an enclosure. The box is ordinarily tuned to a frequency somewhat below the speaker's own resonant peak. It then extends the bass characteristic to a new low and also broadens the speaker resonance somewhat, resulting in much smoother over-all bass response. Because of its simplicity, low cost, and small size, the bass reflex unit is unquestionably the most popular enclosure in use today.



Inner baffles help drive sound through opening

Most experimental effort on high fidelity enclosures today has as its objective an even better bass response than is exhibited by the bass reflex, while at the same time retaining its advantages of simplicity, and small size. Designers in the field are coming more and more to regard the speaker and enclosure as a musical instrument, and to apply to its development the principles of musical physics.

A prime example of such reasoning is the *R-J* enclosure, which is based upon the principle of the *Helmholtz resonator*. The body of a guitar, for example, is such a resonator, and it has the very desirable characteristics of small dimensions as compared to the wavelength of sound at its resonant frequency. It would seem to be a logical assumption, then, that such a box might serve well as a loudspeaker enclosure, with good musical response in a reasonable size.

To understand the operation of the resonator, let's consider what happens when a guitar is held face up and the strings are strummed. Air is set into motion by the

response of only about 13 to 1,300 c.p.s., and is equipped with a separate unit for high-frequency reproduction.

The need for two completely separate systems can be avoided by the use of the back-loading horn, which follows similar principles. In this enclosure, the speaker acts as a direct radiator of sound in the usual manner, while the back wave enters a folded exponential horn. This is really a specialized form of the acoustic labyrinth, then, which permits the use of a coaxial type speaker and radiation at all frequencies from a single source.

### Acoustic Transformers

Since the foremost problem in the design of loudspeaker enclosures concerns the proper matching of the speaker impedance to the impedance of the surrounding air, some designers employ the concept of the *acoustic transformer*, that is, an impedance-matching device for sound. And while an ordinary electrical transformer would not fit for this application, certain techniques used for the transmission of the very high radio frequencies have been successfully borrowed for use with audio.

We know, for example, that the usual solid conductors are not very efficient, as most of the energy at these frequencies travels at the periphery. Hence the transmission lines are usually hollow, as the center area is not usefully conductive. And we have also learned that, simply by the proper dimensioning of a piece of transmission line, the section will act as a matching device between two unlike impedances. Now since sound will travel readily through hollow structures, perhaps such a device could be used for audio, with the speaker source at one end of the matching section, and the air load at the other.

This idea is employed in the *transferrer* unit, which is a part of "The Reproducer of the Future," developed by the Jensen Manufacturing Company. This unit is used for the very low bass response only, cut off by a crossover network at 45 c.p.s. The range from 45 to 600 c.p.s. is handled by a back-loading folded horn, and two tweeters transmit the ranges from 600 to 4,000 c.p.s., and from 4,000 c.p.s. up to the limits of audibility.

### The Karlson Coupler

John E. Karlson has employed these basic concepts, but has come up with a much different result in the *Karlson Ultra-Fidelity Enclosure*. The inventor modestly describes this unit as "no miracle, just the application of well-known basic theory," but it is in fact a truly beautiful piece of scientific reasoning, with an ultimate solution which should please even the most highly critical. With a high quality speaker, the performance of this system is unsurpassed, despite the fact that it is only 22x34 inches high, and 18 inches deep.

The basic idea of this enclosure is that of the *closed pipe*, a common musical device which is used in the piccolo, flute, and some organ pipes, which are open at one end and stopped at the other. When such a pipe is appreciably longer than it is wide, it will resonate at a frequency whose wavelength is four times the length of the pipe itself. It will also resonate at all of the odd harmonics of this frequency, or if it is

producing a tone, the sound will be rich in the odd harmonics of the fundamental. But if a tapered slot is cut into the open end of the pipe, the resonant peaks will be broadened considerably, and if the slot is extended to a point where it is longer than two-thirds of the total pipe length, the resonant condition just about disappears. Now if the slot is given an exponential taper, and if the pipe is of correct dimensions, it will have absolutely uniform response throughout the audible range, while at the same time retaining the "acoustic transformer" effect of a quarter-wavelength matching section of transmission line.

The Karlson enclosure, then, is an adaptation in cabinetry of the slotted pipe, which enables the most efficient use of coaxial speaker systems and eliminates the phase distortion characteristics of multiple systems, where various parts of the audible spectrum arrive at the ear from separated sources. It is absolutely free from resonance, has optimum transient response, and has a radiation pattern which is essentially uniform at all frequencies throughout a solid conical angle of around 120°. It is a new departure in speaker system design, and a new standard of performance.

### Construction and Installation

When building your own enclosure, sturdiness and rigidity are essential to avoid vibration. All joints should have an air-tight fit, and be held with glue and screws. The stock should be heavy, ¾-inch plywood being recommended for most applications. Sound-absorbent materials which have been found useful for the interiors include 2-inch-thick Fiberglas or rock wool. This is readily available at lum-

ber yards, and should be obtained with paper backing on only one side. It should be installed *before* the speaker is mounted, to prevent small fragments from getting into the driver mechanism, and a further excellent precaution is to cover the pads with cheesecloth. The speaker can then be bolted or screwed into place, taking care that all of the holes provided in the mounting ring are used.

The output terminal strip of the amplifier usually has a common connection point—sometimes marked G—and one of a pair of wires is connected from this terminal to one of those on the speaker. Several transformer taps also terminate at this strip, and since most loudspeakers voice coils have an impedance of 6 to 8 ohms, the remaining wire is usually connected from the terminal marked 8 to the other point on the speaker. When crossover networks and multiple speakers are involved, the connections become a little more complex, but the manufacturer will always provide you with detailed instructions which apply to your particular installation.

And now we are at the end of our system, and yet it is really only the beginning. For the process of reconverting electrical energy into sound is absolutely the most formidable task to be performed anywhere in the entire high fidelity chain. As we have already noted—and cannot repeat too often—your speaker system is of primary importance. Nowhere else in the system is there such a very great difference between components of various manufacturers. So proceed slowly, make your choice carefully, and you will choose wisely. When you do, true sound pleasure awaits you. •

REPRINTED FROM

# HI-FI manual

by Donald Carl Hoefler

Fawcett Book #232, Copyright 1954  
Fawcett Publications Incorporated

The Hi-Fi Manual, published by Fawcett Books, contains 144 pages, is lavishly illustrated and only costs 75¢. The clear and simple explanations given make this book of outstanding value to anyone interested in the hi-fi hobby. If not available from your local newsstand send one dollar (75¢ plus 25¢ for mailing and handling) to Audio Publications, Suite 1004, 516 Fifth Avenue, New York 36, N.Y.

### Directional Baffles

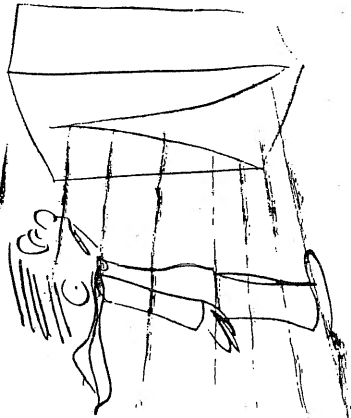
An ever-present problem in the design of loudspeaker systems is the very low efficiency at which these units operate. The acoustic power radiated by a speaker alone may be only 5% of the total electrical power delivered by the amplifier to the voice coil, and one of the important functions of the enclosure is the more efficient coupling of the speaker source to the air load surrounding it. One such arrangement uses a short horn directional baffle which flares out beyond the speaker cone. An enclosed box lined with sound-absorbing material completely surrounds the rear of the speaker, thus preventing any radiation of the back wave. At low frequencies the cone functions as a piston, providing efficiencies on the order of 25%.

An ingeniously compact design based upon these principles is found in the *Klapphorn*, employing a directional baffle in which the horn folds back upon itself several times before forming the mouth. Despite the radical curvature, the taper follows an exponential rate of expansion. Furthermore, it is designed to be fitted into a corner, so that the walls of the room act as a natural extension of the walls of the horn. While the low frequencies will follow freely the sharp folds in the enclosure, the high frequencies will be dissipated. Thus this unit has a frequency



## APPLICATIONS

SPECIFICALLY RECOMMENDED FOR THE FOLLOWING PEOPLE TYPES:



**PAIN THRESHOLDERS:** People who like their music LOUD. Not even a complete theater system will give you more clean, undistorted output volume. This is because the Karlson has a non-resonant front loading chamber which keeps the speaker cone from moving too far and loads it evenly at all frequencies with a resultant smooth response from the lowest bass notes right through to the limits of hearing in the highs.

**THE LARYNGITIS SET:** People who don't mind using a 15" speaker to give them the volume you could normally expect from a 2" speaker. The Karlson is as much for people who like their music soft as it is for those who want the full output of the 50 watt amplifier in the room with them. Even at the lowest audible volume the output of the Karlson Enclosure is smooth and even....the bass is still there, and so are the highs.

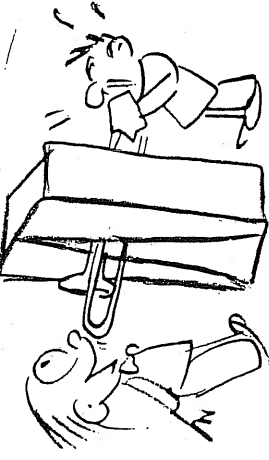
**BARGAIN HUNTERS:** People who buy a \$12 coaxial speaker because the ad in the magazine said it was good from 20 to 20,000 cycles. Although an expensive speaker will sound better (we find that you get about what you pay for in loudspeakers), you will be astounded at the performance that you can get with one of these confounded bargain speakers when you mount it in the Karlson. Even the cheapest of 10" and 12" speakers will amaze you for they will sound comparable to the more expensive units in bass reflex and horn enclosures.



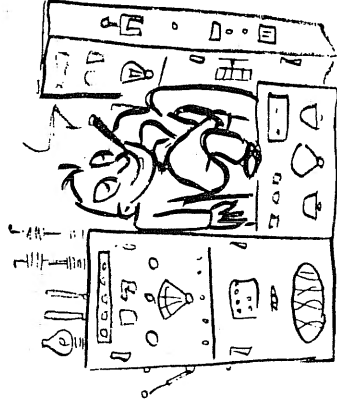
**FOLDED HORN OWNERS:** People who are ready to get rid of the horn quality (megaphone effect) which goes with all horns and folded horns. The Karlson is not in any sense a horn. A true reproducer should impart no quality to the sound itself....it should add nothing and take nothing away. The idea is to reproduce the original sound picture as well as the other components in the system will allow. The bottleneck to good reproduction is no longer the speaker system.



**MUSICIANS:** Every time a musician listens to a Karlson he remarks that for the first time he can hear every instrument in the orchestra clearly and distinctly....he can hear every string on a violin or guitar....he can hear (almost) the rosin on the strings of a bass viol. The realism is tremendous.



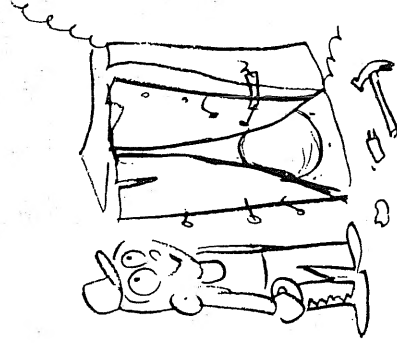
**CLIFF DWELLERS:** People who are plagued by no room for hi-fi and the usual behemoth baffles involved. The Karlson is very small compared to most other enclosures....less than six cubic feet in volume, 22" X 34" X 18" to be specific. Certainly anyone has room for that under their TV set.



**DADDY WARBUCKS....**and his \$1000 amplifier. Even if you can afford \$10,000 for a speaker system you cannot do better than a Karlson....and it is only \$117.60 for the finished model all set to grace your living room. If you must spend more money you can do as several others have done and put in two Karlson Enclosures, one in each corner of the room. Binaural was never this good!

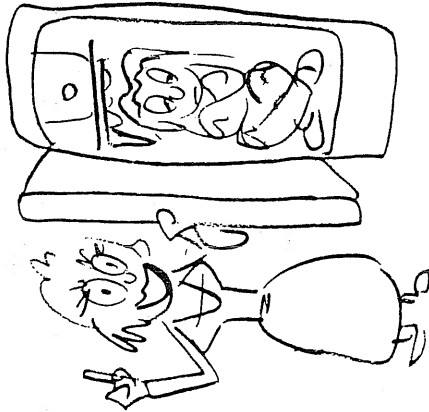
**RESEARCHERS:** The Karlson Enclosure is guaranteed to outperform any laboratory system (not already using a Karlson) now in use. The Karlson will save many hours of work and dollars of expense by making it possible to hear what is going on so much clearer. A lab is no better than the test equipment it uses. We suggest the model 15PU rough plywood unit unless your lab is a showpiece.

**POPULAR MECHANICS:** The boys with the home workshops. The Karlson sells in kit form for only \$45.00 and can be assembled in an hour or so by anyone with experience in woodwork. All you need is a hammer, glue and guts. Lacking any of these you might consider the assembled kit form Karlson (model 15PU) which is only \$65 factory assembled.



absolute prerequisite for the critical listening necessary to honestly render a technical review of a record. Where with other systems you may have to listen several times to a record before you can make a decision with the Karlson you will hear everything on the record clearly and exactly the first time.

**WIVES:** The attractive curved front design of the Karlson will fit in with any decor. It is beautiful. The small size of the unit plus the unusually wide angle dispersion of the sound which it puts out allows you to put it almost anywhere in the room. It will work as well in a corner as it will in the middle of the room.



#### RADIO AND TELEVISION STATIONS:

The engineers, managers, and clients should have the best quality possible. With the growth of high fidelity there is a greater demand for hi-fi broadcasts and telecasts. You can't provide hi-fi if you can't tell the difference in your own studios. Engineers can do a lot better job if they don't have to try to hear what is going on through a 6" speaker. The Karlsonite finished models are best for this purpose since they will take a continuous beating and still look new. Ask for model 15M.

**AUDIOPHILES.** The audiophile is always looking for some way to improve his present hi-fi system. Certainly the single most vast improvement that can be made in any hi-fi setup is the addition of a Karlson. The difference in price between the Karlson and the cheapest of bass reflex boxes will do more for a hi-fi system if it is invested in the speaker enclosure than in any other part of the system.

**ORGANISTS:** Until you hear your Baldwin or Wurlitzer organ with a Karlson tone cabinet hooked up to it you cannot even imagine what an improvement is possible. Intermodulation is eliminated, the reeds develop that beautiful quality associated with pipe organs....and even the lowest pedal note comes through clear and strong.



#### MORE PEOPLE TYPES.....

**MANUFACTURERS:** Production testing with a Karlson will result in faster and more precise work and will save you money and assure you a uniformly good product. The Karlson can be an important production tool for manufacturers of amplifiers, record players, speakers, cartridges, etc.

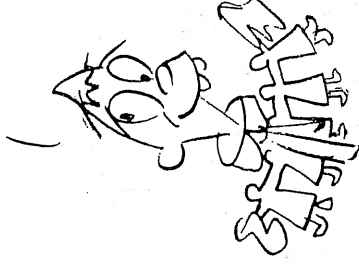
**SIDE-SHOW BARKERS:** If quality in outdoor work is of any importance to you then there is no other answer. The Karlson is the first enclosure ever designed which will actually load up the great outdoors so you can feel the bass notes twenty to thirty feet away. With one Karlson you can outperform a full concert band. The exceptional clarity of the Karlson makes it ideal for public address applications where it is desirable to actually hear what is being announced.

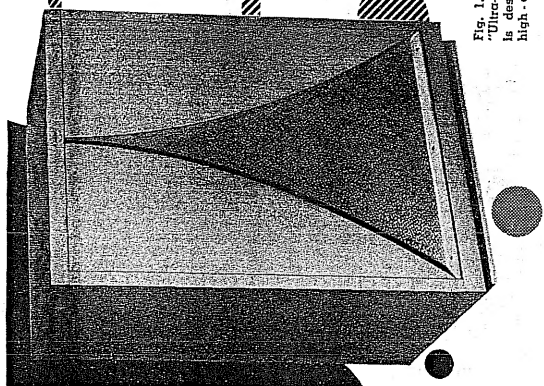
**THEATER OWNERS:** Several theaters and auditoriums have now replaced their huge horn systems worth many thousands of dollars with two Karlson Enclosures and have reported an amazing improvement. Music and voices sound natural. These Karlson systems give far more natural tone than even the most expensive special theater systems in use today for 3D and stereophonic results.

**TYROS:** People who are assembling their first high fidelity music system want to be sure that they are getting the best for their money and are not interested in a long expensive series of tests with first one enclosure and then another. The Karlson, reasonably priced, attractive, and small, certainly is your best value and will never have to be replaced, no matter how much more money you eventually put into the system.

EVERY BODY ELSE IN THEIR RIGHT MIND.

W M U, M E ?





# THE KARLSON SPEAKER ENCLOSURE

By  
**JOHN E. KARLSON**  
Karlson Associates

Fig. 1. Over-all view of the Karlson "Ultra-Fidelity" model enclosure. It is designed specifically to house a high-quality 15-inch loudspeaker.

*Construction and engineering details on an enclosure for 15-inch speakers which incorporates acoustical coupling to provide improved transient response, good definition.*

THIS unit should also fit into the average sized living room. In reviewing all of the available approaches to this problem, it became clear that none of the existing techniques were adequate in meeting these difficult requirements. For example, horns could provide good coupling down to these frequencies if they were big enough, but even if the size could be tolerated, the frequency range could not be covered by a single horn. When the higher frequencies are radiated from horns, an increased reactive beaming effect is experienced which distorts the relative tonal values of the reproduced material. This effect can be reduced by using several horns, but when this is done, accurate transient response. Of course,

out of the realm of the fantastic and into the pale of practical accomplishment, some extremely knotty problems had to be licked. These included the design of an acoustic coupler capable of providing a flat response over the frequency range from 20 to 20,000 cycles, an omnidirectional radiation pattern over the same range, accurate tonal phasing, and nearly optimum transient response. Of course,

phasing for all of the frequency components in any musical sound becomes virtually impossible. When direct radiators are substituted for horns in the higher frequency ranges, phasing difficulties must result due to the widely differing acoustic paths of the high and low frequencies. In addition, the transient responses of horns and direct radiators are noticeably different.

In continuing this analysis it became increasingly obvious that some new acoustic device was needed which could meet these requirements. As a result the exponential coupler was brought into existence. Fortunately, the inherent characteristics of this type of coupler are almost ideal for our requirements in that it has:

- (a) A flat frequency response over a desired range
  - (b) Extremely uniform dispersion of sound at all frequencies when properly designed
  - (c) Excellent transient response
  - (d) Potentialities for point-source phasing
- Probably the least obvious advantage in the list is that of point-source phasing. However, when we consider that only a point source of sound provides absolutely uniform dispersion and phasing at all frequencies, the importance of this feature becomes a little more obvious. Strangely enough,

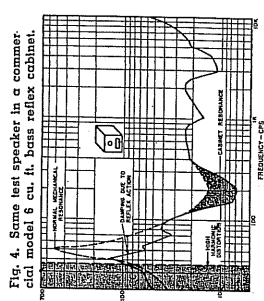


Fig. 2. Impedance characteristics of test speaker measured without any enclosure.

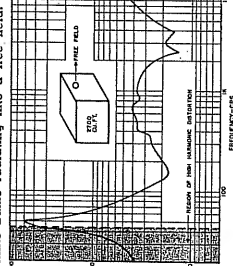


Fig. 3. Same speaker in 2700 cu. ft. infinite baffle radiating into a free field.

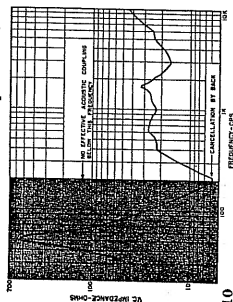


Fig. 4. Same test speaker in a commercial model 5 cu. ft. bass reflex cabinet.

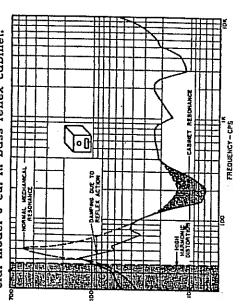


Fig. 5. Complete mechanical details on the Karlson "Ultra-Fidelity" enclosure. A 12-inch speaker can be used either using a separate conversion board or cutting the speaker opening smaller. This particular cabinet was designed for use with a conical type speaker. If a single speaker is used, it should be of the extended-range type.

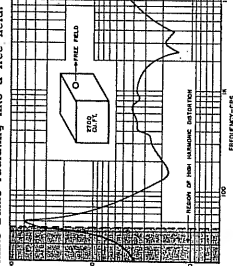


Fig. 6. Same test speaker in a corner reflex cabinet.

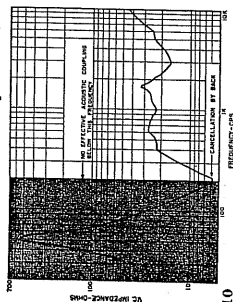


Fig. 7. Same test speaker in a corner reflex cabinet.

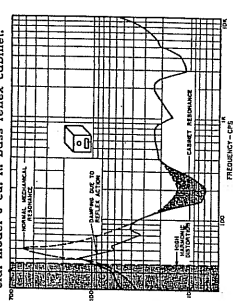


Fig. 8. Same test speaker in a corner reflex cabinet.

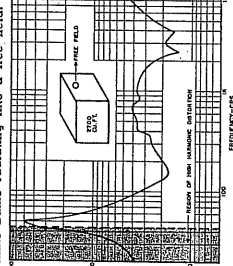


Fig. 9. Same test speaker in a corner reflex cabinet.

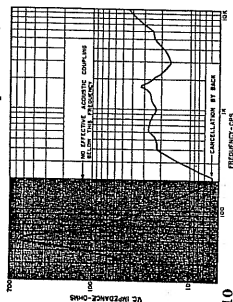


Fig. 10. Same test speaker in a corner reflex cabinet.

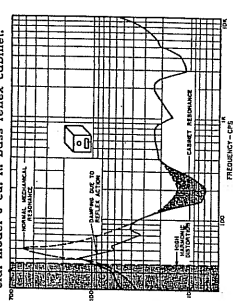


Fig. 11. Same test speaker in a corner reflex cabinet.

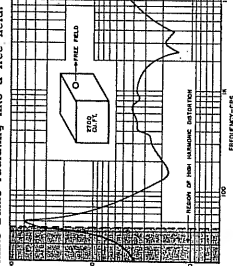


Fig. 12. Same test speaker in a corner reflex cabinet.

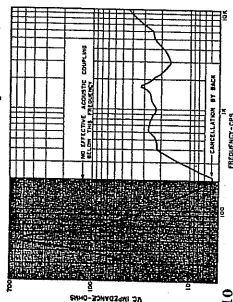


Fig. 13. Same test speaker in a corner reflex cabinet.

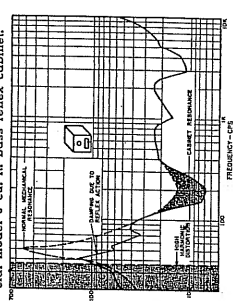


Fig. 14. Same test speaker in a corner reflex cabinet.

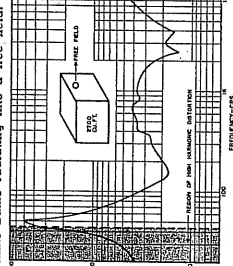


Fig. 15. Same test speaker in a corner reflex cabinet.

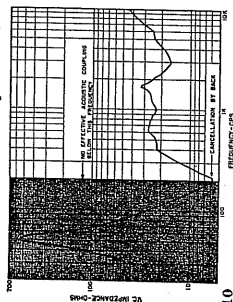


Fig. 16. Same test speaker in a corner reflex cabinet.

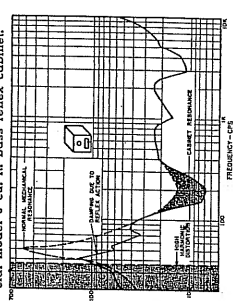


Fig. 17. Same test speaker in a corner reflex cabinet.

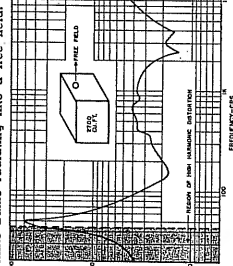


Fig. 18. Same test speaker in a corner reflex cabinet.

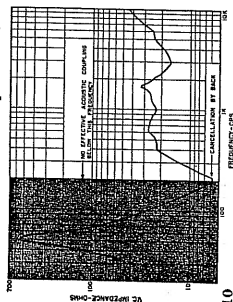


Fig. 19. Same test speaker in a corner reflex cabinet.

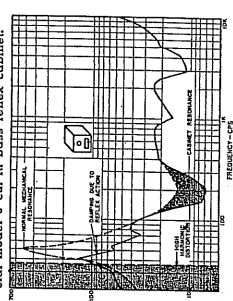


Fig. 20. Same test speaker in a corner reflex cabinet.

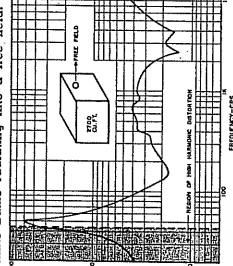


Fig. 21. Same test speaker in a corner reflex cabinet.

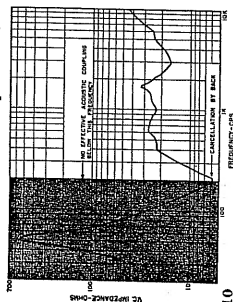


Fig. 22. Same test speaker in a corner reflex cabinet.

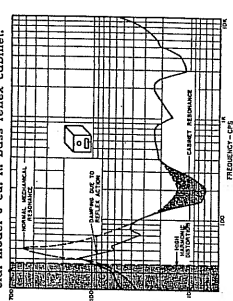


Fig. 23. Same test speaker in a corner reflex cabinet.

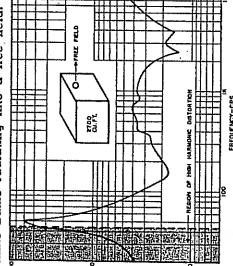


Fig. 24. Same test speaker in a corner reflex cabinet.

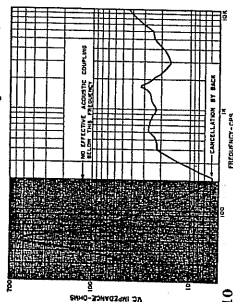


Fig. 25. Same test speaker in a corner reflex cabinet.

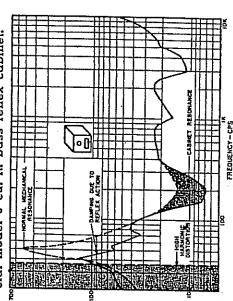


Fig. 26. Same test speaker in a corner reflex cabinet.

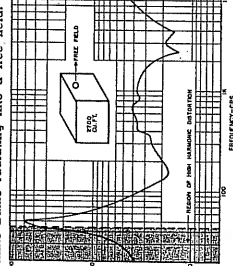


Fig. 27. Same test speaker in a corner reflex cabinet.

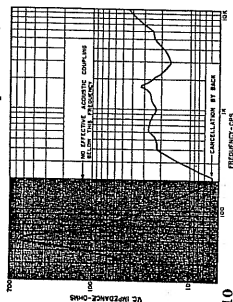


Fig. 28. Same test speaker in a corner reflex cabinet.

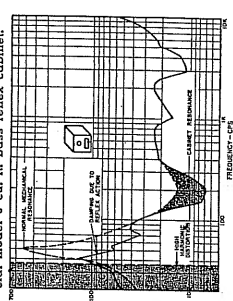


Fig. 29. Same test speaker in a corner reflex cabinet.

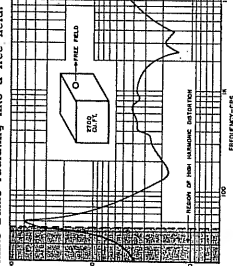


Fig. 30. Same test speaker in a corner reflex cabinet.

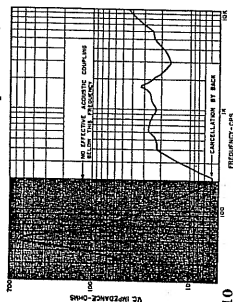


Fig. 31. Same test speaker in a corner reflex cabinet.

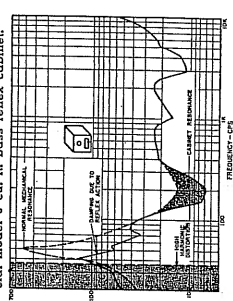


Fig. 32. Same test speaker in a corner reflex cabinet.

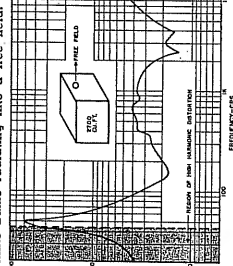


Fig. 33. Same test speaker in a corner reflex cabinet.

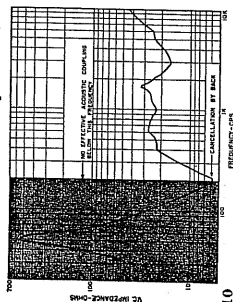


Fig. 34. Same test speaker in a corner reflex cabinet.

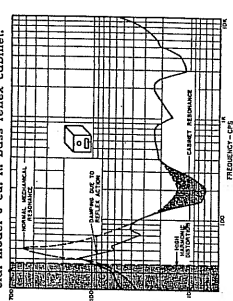


Fig. 35. Same test speaker in a corner reflex cabinet.

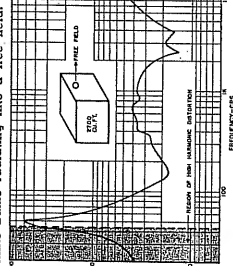


Fig. 36. Same test speaker in a corner reflex cabinet.

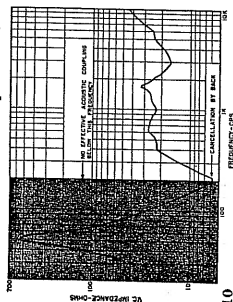


Fig. 37. Same test speaker in a corner reflex cabinet.

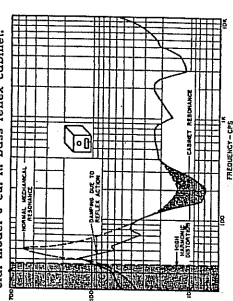


Fig. 38. Same test speaker in a corner reflex cabinet.

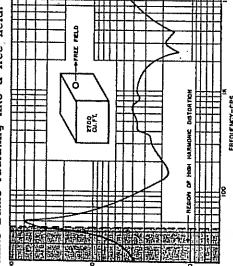


Fig. 39. Same test speaker in a corner reflex cabinet.

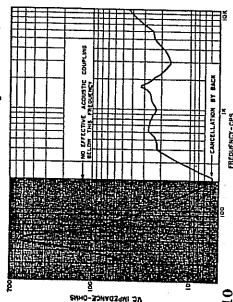


Fig. 40. Same test speaker in a corner reflex cabinet.

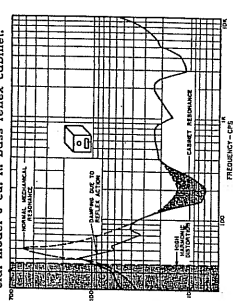


Fig. 41. Same test speaker in a corner reflex cabinet.

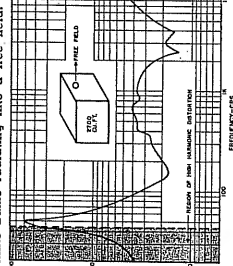


Fig. 42. Same test speaker in a corner reflex cabinet.

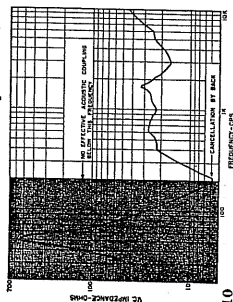


Fig. 43. Same test speaker in a corner reflex cabinet.

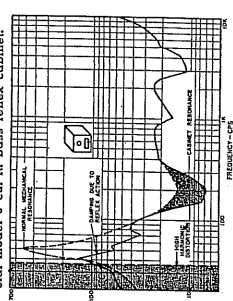


Fig. 44. Same test speaker in a corner reflex cabinet.

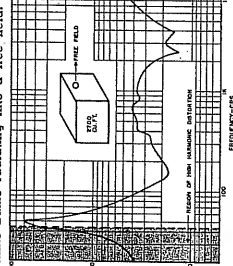


Fig. 45. Same test speaker in a corner reflex cabinet.

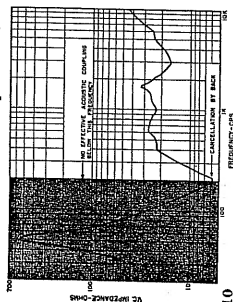


Fig. 46. Same test speaker in a corner reflex cabinet.

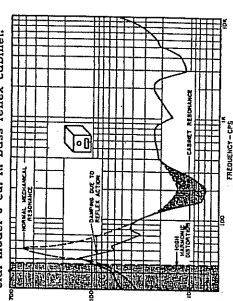


Fig. 47. Same test speaker in a corner reflex cabinet.

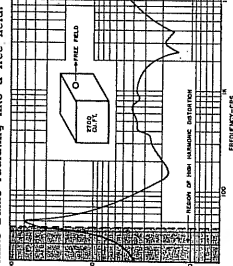


Fig. 48. Same test speaker in a corner reflex cabinet.

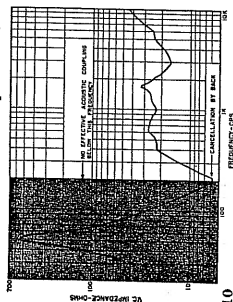


Fig. 49. Same test speaker in a corner reflex cabinet.

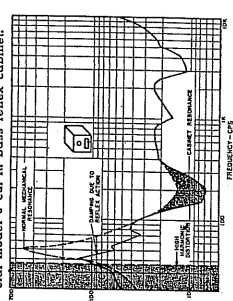


Fig. 50. Same test speaker in a corner reflex cabinet.

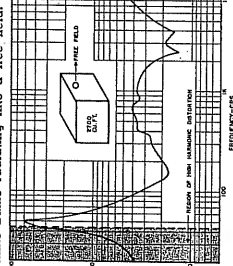


Fig. 51. Same test speaker in a corner reflex cabinet.

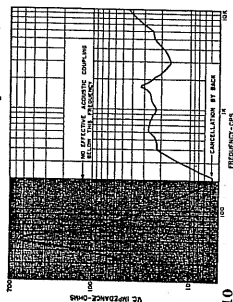


Fig. 52. Same test speaker in a corner reflex cabinet.

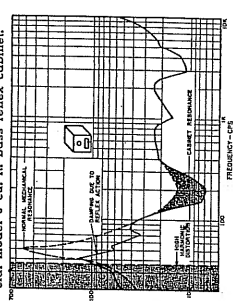


Fig. 53. Same test speaker in a corner reflex cabinet.

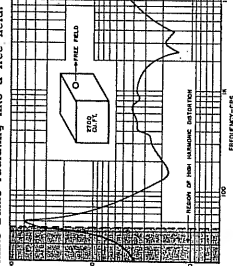


Fig. 54. Same test speaker in a corner reflex cabinet.

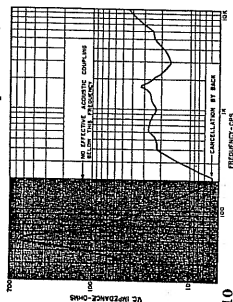


Fig. 55. Same test speaker in a corner reflex cabinet.

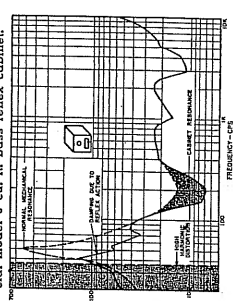


Fig. 56. Same test speaker in a corner reflex cabinet.

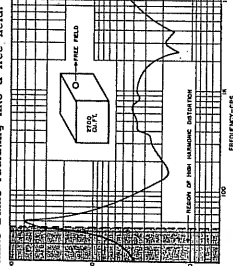


Fig. 57. Same test speaker in a corner reflex cabinet.

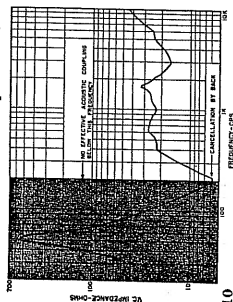


Fig. 58. Same test speaker in a corner reflex cabinet.

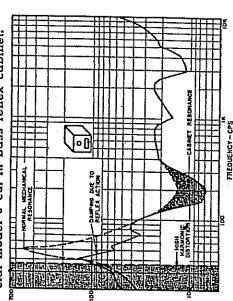


Fig. 59. Same test speaker in a corner reflex cabinet.

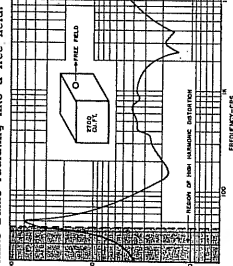


Fig. 60. Same test speaker in a corner reflex cabinet.

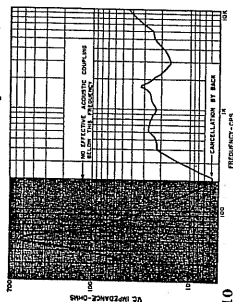
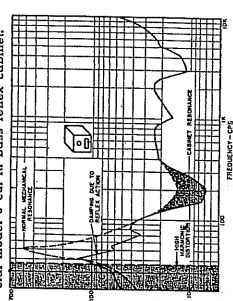


Fig. 61. Same test speaker in a corner reflex cabinet.





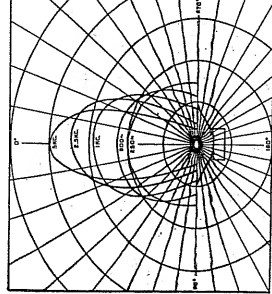


Fig. 6. Relative responses with constant acoustic output for 15° direct-radiator. Side lobes are omitted to simplify graph.

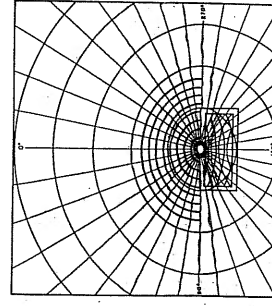


Fig. 7. Uniform dispersion characteristics of radiation from cone. Very little variation occurs with changes of frequency.

achieved by the infinite baffle type of mounting, and therefore its primary advantage is that of isolating the frontwave from the backwave of the speaker. Naturally any sound occurring in a region of 50 cycles in an infinite baffle of this size would send the waves into the cone, and the prolonged oscillation even when the speaker has this extended travel, it necessarily produce a considerably greater output at this single frequency because the vibration of the cone is in phase with the sound wave, and a proportionate amount of acoustic power. In other words, without auxiliary coupling to the air, a cone will simply beat the air ineffectively at the very low frequencies. Some improvement in this mechanical resonance curve is shown by the use of a bass reflex cabinet tuned to anti-resonance at the same frequency. See Fig. 4. Also, the radiation from the port in the neighborhood of this frequency will increase the efficiency of the speaker output in this general range. However, below this resonant frequency harmonic distortion increases very rapidly with the result that at 30 cycles fundamental coupling is virtually non-existent. Note also that a serious dip in the region from 120-350 cycles, the region of maximum voice power. This dip with the consequent adjacent peaks causes a considerable amount of overloading which is typical of many such enclosures. The cabinet tested was one of a standard commercial design with a volume of approximately 6 cu. ft. The impedance curve of the same speaker in the *Karlsen* enclosure (Fig. 8) indicates a decided change from the previous tests. First of all, note the complete absence of any indication of a single mechanical resonance curve as is evidenced in the previous tests. The curve resulting from these tests is very similar to that found with very large exponential horns, and is also characteristic of almost all exponentially tapered terminations which are used in achieving a flat response over extraordinarily wide bandwidths. As shown in Fig. 9, this type of curve is peculiar to a special case in the normal resonance formula, and occurs near the point of optimum critical damping at which the resonant frequency of a system is zero. This optimum value occurs only in horns or other distributed parameter devices when they approach an infinite size. Since optimum coupling can only be achieved in a device having distributed parameters and its losses primarily due to radiation resistance, this curve therefore represents an almost ideal performance relative to its size. The

Also, when a cone is subjected to large excursions which take it beyond its limits of linear travel, intermodulation effects occur which generate a whole series of sum and difference frequencies. The net result is likely to be somewhat fuzzy. Now, with heavy damping on both the front and back of the speaker cone, these spurious oscillations are largely damped out or eliminated. Also, due to the heavier loading, the cone requires less travel for the same acoustic output with the result that excursions in the non-linear region of the cone travel are unnecessary for even the loudest level of operation. Loading only one side of a cone cannot possibly achieve the same results because full control of the cone doesn't exist over the complete cycle of its travel.

### Coupling Performance

A series of tests was conducted, as previously indicated, to establish the characteristics of the coupling achieved in the "Ultra-Fidelity" enclosure. The most significant indication was considered to be that of taking a series of electrical impedance curves from mounting the speaker in various forms of enclosures. A curve was first taken of a speaker lying on a bench without any enclosure or baffle board attached. The results of this test are shown in Fig. 2. It will be observed that cut-off occurs in the region of 200 cycles, but that the general slope of the mechanical resonance peak, occurring at 50 cycles, is virtually identical to that found in Fig. 3, which shows a corresponding curve with the speaker mounted in an extremely large infinite baffle radiating into a free field. Apparently there is virtually no difference in the coupling

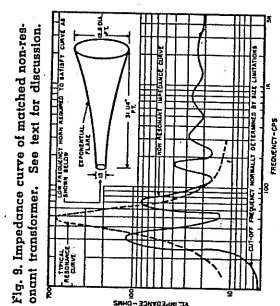


Fig. 8. Impedance curve in *Karlsen* enclosure showing its nonresonant character.

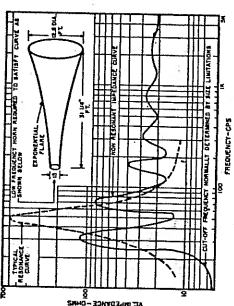


Fig. 9. Impedance curve of matched non-resonant transformer. See text for discussion.

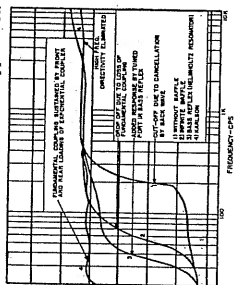


Fig. 10. Frequency response curves of *Karlsen* compared with other standard approaches.

cause some variation in the frequency response. Olson states that a deviation of impedance on the order of 6:1 is required to change the acoustical output 2 db, so it is obvious that the departure from the mean due to the largest deviation shown is a fraction of 1 db. It is accepted that 2 db is the minimum difference in level that can be detected so this minor departure from the ideal is considered acceptable. An important characteristic of such curves is the non-harmonic relationship of the peaks and valleys therein. Thus for a note at 30 cycles no reinforcement is given to the second harmonic at 60 cycles or the third harmonic at 90 cycles. This characteristic still further improves the cleanness of the bass response. It is estimated that no more than 2% harmonic distortion occurs at 30 cycles in the *Karlsen* enclosure. When the impedance curve of this enclosure is normalized to compensate for the obvious dip in the speaker impedance, it is seen that the matching and transition from the lowest to the highest frequencies occurs with extreme smoothness and continuity, thus indicating the value of the exponential coupler as an acoustic transformer. An exponential horn 31 1/2 ft. long with a mouth diameter of 12 1/2 ft. and throat diameter of 15 in. would be required to approach this performance.

Fig. 10 illustrates the various characteristic frequency response curves resulting from the use of these types of enclosures. The acoustic output of a driver falls off quite rapidly in the lower frequencies, due to its inability to properly couple to the air. With the exponential coupler these difficulties are largely overcome.

### Radiation Characteristics

If frequency response were our sole concern, then our design problem would be virtually ended. However, the radiation characteristics of a sound source must also be considered. Ideally the sound from a loudspeaker system should be radiated in a completely uniform manner for all frequencies. When this is not done the loudspeaker system will create entirely different tonal values in the reproduced music than that contained in the original sound. Ordinarily a "hi-fi" enthusiast will quibble over a fraction of a db in an amplifier, and yet it is not uncommon to have a difference of 20 db between the main lobe of a speaker radiation pattern and the side lobes. Obviously high-fidelity reproduction is a misnomer under such conditions. Some may argue that standing waves in a room will vary that much, so why worry about it. However, when we consider that all sound is made up of transients rather than steady-state conditions, the relative intensities of the direct radiation from the enclosure become predominantly important since these transients are not of sufficient duration to create standing waves.

Unfortunately, most loudspeakers and horn combinations have variable radiation patterns for each frequency. At the lower frequencies there is not sufficient deviation to cause real concern. For example, when we approach the higher frequencies above 1000 cycles, it is common to observe highly directive beaming effects. If we imagine a

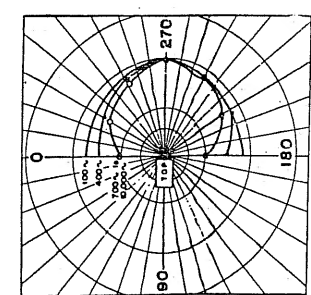


Fig. 11. Polar radiation pattern for (A) horizontal and (B) vertical planes.

different distribution of sound for every frequency above 1000 cycles, we can have some appreciation of why some high-fidelity systems sound distorted and unnatural. Almost all musical instruments operate from relatively small sources of sound with respect to their frequency ranges. Obviously they cannot be reproduced accurately with systems which do otherwise. Fig. 6 shows a typical family of radiation curves of the main lobes inherent to a 15 in. speaker at several different frequencies. The side lobes have been omitted for the sake of simplicity. This should give one some idea of how the sound is frequently reproduced in even the most expensive high-fidelity systems. Various devices have been used to overcome this effect such as small horns, special tweeter speakers, etc., but still the answers achieved are a strong compromise with the ideal. In contrast to this the radiation pattern of sound emanating from a slot is shown in Fig. 7. This, of course, represents the ideal theoretical case. In practice, however, the deviations from this ideal are relatively minor as can be seen from the polar radiation plot shown in Fig. 11, for both the horizontal and vertical planes. The radiation in the horizontal plane is extremely uniform over an angle in excess of 120 degrees. This performance is analogous to that of the TV antennas in use on the Empire State Building in New York City. These are omnidirectional in the horizontal plane and have a narrowing beam in the vertical plane. Some narrowing occurs with the *Karlsen* enclosure in this vertical plane. However, the phasing has been so adjusted that even this deviation from the ideal is minimized. As a result, this enclosure has an essentially uniform radiation pattern throughout a solid conical angle of 120 degrees. This angle of radiation, by virtue of the design, is tipped upward so that its apex falls nearly at the intersection between the floor and the wall against which the unit is placed. This feature still further enhances the coupling between the enclosure and the room due to the reinforcement of these two plane surfaces. When the enclosure is placed in a corner, this reinforcement occurs with three plane surfaces, and an appreciable power gain is thus realized in the low frequency range.

The entire assembly is glued, nailed and screwed together as required with the back being removable for the insertion of the speaker. The speaker chamber has been designed to accommodate all of the well-known types available. Speakers smaller than 15 in. are mounted by means of an adapter plate which fits over the normal 15 in. speaker opening. Since the sizes of many of the parts are quite critical, the production enclosures are all cut with the use of special jigs to obtain absolute uniformity of performance. The parts fit together like a jigsaw puzzle due to the daddo construction and are quite readily assembled.

A partial list of speakers suitable for use with this enclosure is given in Fig. 5 to aid those who wish to build this enclosure. The performance of these speakers in this enclosure are closely allied with the quality of the speaker selected.

# Reprinted from



# KARLSON data sheet

## JUST TWO SIZES

Though we have sixteen or so different models of the Karlson available, they are all either made one size or the other, 15" or 12". The 15" Karlson Ultra-Fidelity Enclosure is the primary size and gives the best overall results. The 12" Karlsonette is designed for applications where there isn't room for the large unit. The overall dimensions of the large unit are: 34 $\frac{1}{2}$ " X 22 $\frac{3}{4}$ " X 18" and it weighs from 69 pounds for the kit to 80 pounds for the Karlsonite finished models. The smaller Karlsonette measures: 24 $\frac{3}{4}$ " X 16 $\frac{3}{4}$ " X 13 $\frac{3}{4}$ " and it weighs from 32 to 40 pounds, depending upon the model. The model you choose depends on how much you want to pay and how much of the work you want to do yourself.

## THE KITS

The primary purpose of our selling the plywood kit Karlson Enclosure, model 15PK \$45.00 and model 12PK \$37.50, is to satisfy the growing demand for do-it-yourself fans who want a unit they can assemble in preference to a factory assembled unit. Generally it isn't a question of the money for our assembled units are only a bit more expensive. The kits consist of about 50 intricately cut pieces, dado'd side panels, etc., which fit together like a jigsaw puzzle. Few craftsmen can equal the accuracy of our precut kits for home type tools just are not that good. We include full finishing instructions with each kit so that the plywood can be made into a piece of furniture suitable to grace your livingroom. In the near future we hope to have a complete finishing kit available as an accessory.

## PLYWOOD MODELS

With care the home assembler can come close to the job that we do in the factory with our large presses and special high frequency gluing equipment. The extra cost of the assembled models (model 15PU \$65.00 and model 12PU \$55.50) is little enough to pay if there is any doubt whatever about your ability to do a first class job of gluing. After all, the really important thing is to have a finished enclosure that will positively work perfectly and stay vibration-free and non-resonant no matter how much pressure is built up inside with the playing of full orchestra passages and bass drums. 'Do the job right the first time.

## FINISHING IT

Though the plywood model Karlson Enclosures may be used in certain applications where the unit is hidden in a wall or in a closet, most users will eventually want the unit to pass as furniture. It may be finished quite handsomely with Rez sealer and colored Rez (the PU models come all sanded and puttied ready for finishing) or one of the many veneers now

on the market may be used by gluing it to the cabinet. These veneers come in natural wood or in plastic. Professional furniture finishing is quite an art though and unless you have had some experience the result will not be mistaken for professional. Not even a professional can hope to approach the lustrous finish that we get by using a bonded plastic. Our Karlsonite models are available in either Blond or Mahogany (models 15B and 15M are \$117.60, models 12M and 12B are \$99.60). This is ideal for furniture for it does not stain, burn, rub or scratch easily. Our Karlsonite models are the last work in beauty, design, and ruggedness as well as performance.

## REMOVING SCRATCHES

Karlsonite is difficult to scratch, but even so any scratch can be easily removed by the use of fine steel wool so that no sign of the scratch is visible.

## FULL GRILLE CLOTH FRONTS

Most everyone seems to prefer the beautiful design of the regular Karlson curved front, however you may want a rectangular front design with a full grille cloth. This is available in the 15" models only in either Blonde or Mahogany Karlsonite finish....designated models 15BG and 15MG. Same price: \$117.60

## WOOD FINISHED MODELS

If you are more interested in matching other furniture we have the 15" models available in a wide selection of natural woods (see the price list on back cover for available woods). These units are made on a purely custom basis and delivery will normally be about four weeks. Specify how you want your unit finished...or send in a sample for us to match as close as we can. This service is largely a courtesy so the price is very low: Unfinished custom models are \$135 and hand finished units are \$150. On custom models be sure to mention whether you want a full grille cloth front or a regular Karlson front.

## POSITIONING THE KARLSON

The Karlson Enclosure is certainly the most flexible cabinet on the market as far as its positioning is concerned. You can use it in a corner, along one wall, or right out in the middle of the room. Since the speaker is mounted in the enclosure tilted up at a 30° angle there is some directivity of the sound away from the bottom of the unit, away from the floor and up into the listening area of the room. This reduces the amount of sound usually lost into the rug and into the apartment downstairs. If you plan to mount your Karlson above the listening area it is a good idea to mount it upside down. There are no problems to using the Karlson on its side as long as you keep in mind the directivity toward the "top" of the enclosure and put that end towards the bulk of the room. The plywood models can be fitted with full grille cloth fronts, and mounted on their sides to form a table. The 15" unit will then be 22" high and the 12" unit will be about 17" high without its base and 22" high with the base.

CORNERING THE KARLSON

Though the Karlson does not depend upon the corner of the room to help with the bass response there will naturally be some increase in efficiency when the unit is placed in the corner. There is adequate bass though even when the unit is operated in the middle of an open field, which cannot be said for any other system now known. The 1200 wide angle radiation of the high frequencies gives you an even distribution of sound throughout the room comparing with the 450 to 900 that can be expected from other types of enclosures.

DOES IT REALLY WORK....OR ARE WE KIDDING?

From time to time we get calls from dealers or letters from customers saying that their Karlson doesn't work. So far we have been able to figure out the difficulties in pretty short order and they all generally fall into a few simple patterns. The most common source of trouble is the leaving out of some of the back screws. This sets up all kinds of resonances and frequently completely kills the bass response. Every screw should be in the back tightly, double check it. One customer raised such a fuss about how he had been duped into buying a Karlson that we visited him personally and found that he had put one of the speaker mounting screws in at an angle and the speaker wasn't seated tightly, that fixed it. Now and then we find that a speaker will gradually unscrew itself if the owner didn't use enough muscle in the installation. Sometimes the speaker itself will develop a loose screw which will buzz and rattle. The quality control of some speaker manufacturers is pretty lax and we have run across dozens of units that never should have left the factory. If your speaker doesn't sound terrific and exciting i the Karlson then something is wrong. Oh we make mistakes too, but not often. A few of our finished models got out of the factory without the inside of the front chamber being finished off properly....the inside should be almost glassy hard. Now and then we manage to get two left wings in a kit...but all in all nine out of ten cases of trouble are outlined above.

HOW ABOUT THE HIGHS

If there is any problem with the high frequency response you should check to make sure that the tweeter flared horn is mounted vertically (per our instruction sheet). Make sure the speaker is on our recommended list, a few speakers just don't have it in the high end. Some improvement may be made if you spray some plastic or lacquer on the surfaces of the front chamber, both top and bottom.

WHERE IS THE BASS?

Good bass response can be felt more than it can be heard. If you are getting fundamental response many of the notes will be almost inaudible. A few months ago I took a Karlson into a store to try to get the dealer to take on the line. He gave it a thorough testing before he would accept it for sale, as many dealers do. One of the tests he conducted was to

compare the Karlson with a Jensen H-530 speaker in it to a \$600 system he had in the corner. When he swung his audio oscillator into the 30 cycle region several bystanders marveled at the beautiful bass that emerged from the corner system while little seemed to be heard when he switched to the Karlson. Clearly a case of the other system having a better bass end eh? When one of them mentioned it to the dealer he introduced them to Fletcher-Munson by pointing out that 2% second harmonic distortion would sound louder than the fundamental. In other words, the corner system sounded louder because it was putting out primarily 60 cycles which is more audible and the Karlson was putting out the clean fundamental 30 cycles. He further proved his point by turning the oscillator to 20 cycles and switching it on and off through the Karlson so they could feel the great pressure changes in the room.

HOW FAR DOWN WILL IT GO?

We don't know. At the Los Angeles audio show we found that we could set up an eight cycle oscillation between the record player and the speaker. Even though all of the windows were wide open and the room filled to capacity with people we were still able to develop pressures that were almost painful. Exhibitors in the next rooms complained that their equipment started crawling off the display tables. The hotel reported that the vibration could be felt from the lobby all the way up to six floors above us. This was all done with one Stephens 206AX speaker in the Karlson and a thirty watt McIntosh amplifier. The distortion was so low even at this frequency that there was little to hear, only pressures to be felt.

RESPONSE WITH A 12" SPEAKER

For permanent use it is recommended that a 12" speaker be used in the Karlson 12 Enclosure since the impedance match is somewhat smoother over the whole spectrum. If you are planning to eventually go to a 15" speaker you will do well to use the larger Karlson Enclosure and an adapting board for your 12" unit. One or two of the 12" speakers may give you a bit of a hollow sound in the 15" cabinet, however this is easily cured if you happen to run into it. The addition of some extra padding tacked to the back cover (inside) will clean things up nicely. Since this is a rare phenomenon we do not supply the padding for this modification. T'ain't critical anyway. You can use most any home insulation such as Kimsol, balsam wool, or old towels.

GRILLE CLOTH FOR THE KITS

Since most dealers carry a pretty good stock of grille cloth of the plastic and other varieties, and since you can use almost any cloth you want for a grille cloth we have placed the responsibility for this item on the user. This enables you to choose material which will best blend with your room. Do not ask us to supply grille cloth, please.



# Kit For Do-It-Yourself Enclosure Proves OK

By ROBERT OAKES JORDAN

With the advent of the do-it-yourself spirit, the field of high fidelity was bound to feel the effects of the kit maker and his low-cost product. When the first electronic apparatus kits appeared on the market, there was much to be desired in the equipment built with them.

Some manufacturers of these kits spent time and money to improve their products, but others have gone on producing inferior kits from which Ed-Jordan would have trouble constructing an amplifier.



Jordan

I will try now to begin to present each type of kit from the viewpoints of the amateur builder and the expert, provided I can find one of each who is willing to spend a day in the laboratory putting together an amplifier, tuner, or speaker enclosure which he never has seen before.

The apparatus considered in this column is the Karlson speaker enclosure designed by John E. Karlson of Karlson Associates, 1433 Coney Island Ave., Brooklyn 30, N. Y.

Two enclosures in kit form arrived, plus one ready-made enclosure to show how it should look after construction. I picked two friends to help in the test.

## Expert Picked

For the expert, I asked James Cunningham of Chicago NBC, who works with me on many other projects including the Supplemental Buyer's Aid. Cunningham is an engineer, graduate musician, and chemist. The nonexpert was a volunteer, Robert Groetzing, business engineer, efficiency expert, and confuser of kit instructions from way back.

We three — expert, nonexpert, and spectator (me) — were ready to begin our project. The floor of the machine room was cleared of every movable machine, and the two unboxed kits were stacked at opposite corners. Cunningham and Groetzing worked on their respective wood piles as I retired to watch from the ready-made enclosure.

I must admit that I had visions of fantastic creations in plywood with scarcely a resemblance to the finished Karlson enclosure. I expected also to have two new and completely rewritten instruction books, one for engineers and the other for stark efficiency. I settled back with a fresh cup of coffee and waited.

Cunningham struck the first hammer blow, and the race was on — nail to the right, tack to the left, ruler . . . each in its place. Yet not a move from efficiency expert Groetzing. He just knelt there in front of his pile of pre-sawed plywood, planning. Then he made an occasional move, like a champion chess player, but still no glue, nails, or ruler.

Cunningham almost had finished his practice assembly (both later confirmed that this "dry run" or practice assembly was a must in the assembly of the Karlson enclosure kit). Groetzing had laid out a neat mosaic of plywood parts without a piece of wood above floor level.

Cunningham dismantled his unit and got ready for the final assembly with glue, nails, and determination. As I finished the glue mix (correct proportions of Weldwood glue and water), I saw the reason for Groetzing's methodical layout. He had been busy with the chalk, carefully lettering and numbering the various pieces and edges. Now each board and edge had its place. As far as I could tell, Cunningham had done the same thing in his mind during the trial run.

## Final Assembly Set

Both contestants signaled that they were ready for the final assembly of the Karlson enclosure. By this time more than an hour had elapsed.

As the structures began to rise, I noticed that both men were proceeding according to the instruction manual, and all the pieces seemed to fit in place. A ruler was necessary for checking to see that the next piece of the kit would fit. Progress continued for two more hours without a serious hitch other than an occasional minor collapse of a brace or inner section.

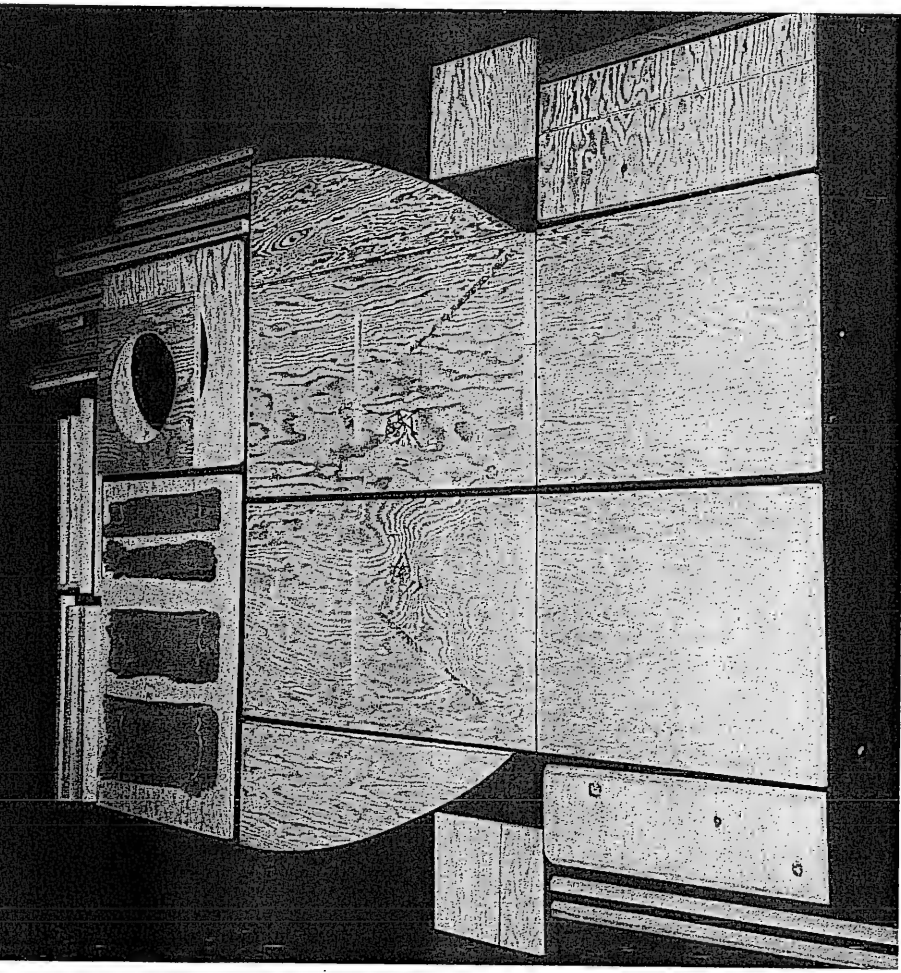
Both kit "mechanics" finished about the same time, each producing a fine, sturdy Karlson enclosure which anyone could recognize as the real thing. The only drawback was the amount of glue on the floor, which they left for me to clean up.

The January 12, 1955 issue of Down Beat carried this interesting story of two men assembling the Karlson Enclosure Kit. Our thanks Down Beat for permission to reprint the article in its entirety.

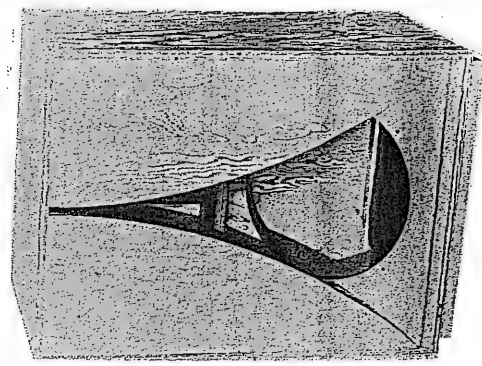
The next day I gave the units relative tests and found them performed essentially the same. Laboratory checks with a Brothers calibrated 333 and 450 cps calibrated microphone. The Karlson kit is a good one. (Ed-Jordan, High Fidelity, stamped, self-addressed envelope, please send reply.)

High Fidelity

DOWN BEAT



Model 15PK



The Assembled Kit

The Karlson  
Ultra-Fidelity  
Enclosure  
Kit

The Karlson Enclosure is a musical instrument, not just a cabinet or sounding box. It has been very carefully designed to give flat response over the entire audio spectrum, something instrument designers have been seeking for centuries but have been unable to accomplish due to the inherent deficiencies of the existent acoustic principles with which they had to work.

When you have completed assembly of the Karlson kit and have allowed the glue adequate time for drying you can check the solidity of your work with a rubber mallet. Bong the cabinet and listen carefully for any signs of vibration or looseness. Before installing the speaker even for the first test complete the spraying or painting of the inside of the front chamber, both bottom and top. This should have a triple coat of varnish or some other hard surfaced coating. The harder this surface the better will be the results.

Next you install the speaker. The eighth screw (bottom) is almost impossible to put in; you have two choices: risk your sanity and put the thing in, or leave it out. The other seven will hold the speaker quite adequately. If you suffer from thoroughness then you can get the offset screwdrivers, knuckle guards, and unlimited patience. Or you can craftily drill a small hole in the bottom of the cabinet at the place where the screwdriver will hit the screw. Later you can plug this convenient access hole.

Hook on your speaker wires and run them through the hole in the back of the cabinet. Drop the back into place and put in all 14 screws tightly. The notion that the fewer you put in the fewer you have to take out has ruined a lot of demonstrations and is suspected of even causing a well known equipment reviewer who should know better to give a poor report on the Karlson. ALL SCREWS MUST BE IN THE BACK TIGHTLY.

After you have listened to music for awhile and can finally come down to earth enough to make more scientific tests you will need an audio oscillator. Sweep slowly in the range from 20 to 100 cycles and listen for buzzing sounds. At lower levels you will hear either a peak or a dip in the response, but at higher levels there may be a buzzing which will give away the loose joints. Any peaks or dips in the response will be due to joints being loose. The part that most often causes trouble is one of the front wings. You cannot check the strength of the joint by just pushing against it with the hand. When a joint is suspected of being loose you have to either reglue it or else strengthen it with another glue block and/or screws.

Please do not succumb to the notion that you can make improvements in the design of the enclosure. More and better padding will not result in improvement. Drilling holes in the wings for tweeters will not help either.

The fact that you have had a cabinetmaker assemble the kit does not assure you good results. The only thing that will positively assure you perfect results is if you let us assemble the unit in our own factory. This service we render very reasonably and the product is model 15PU which sells for only \$65.

## INSTALLATION INSTRUCTIONS

The Karlson Enclosure represents the most advanced acoustic design available at any price. When used with a loudspeaker and associated equipment of a similar character you can expect the ultimate in the reproduction of sound.

### MOUNTING THE SPEAKER

Lay the enclosure face-down on a clean non-gritty surface (rug) and remove the screws from the back cover. Once the screws are removed stand the enclosure upright and tilt backwards just a bit until the back cover falls out. Inside the cabinet you will find an envelope with eight screws and washers for mounting the speaker (round head screws) and also the remaining screws for the back cover (flat head screws). Again lay the enclosure down. You should find eight pilot holes correctly spaced for most types of speakers.

### MOUNT FLARED HORNS VERTICAL

Speakers such as the Altec and Stephens which have a small flared horn in the center of the cone should be placed in the cabinet so that this flare is vertical, even though the instructions that come with the speaker say otherwise. The curved front of the Karlson will give you all the horizontal sound dispersion you want so it is best to aim the high frequencies out through the curve rather than into the corners of the cabinet. The screws holding the speaker in place should be carefully tightened to make sure that none of the washers can rattle.

### CROSS-OVER NETWORKS

If your speaker has a separate cross-over network there is plenty of room for this to be mounted inside the back on one of the side panels. Even the large and complex affair that comes with the Jensen G-610 can easily be accommodated. The cross-over controls (if any) will probably not be used so you can either leave them inside the back of the enclosure or mount them on the back cover. If left inside it is best to tape them to one of the pads so they won't rattle. Adjustment of the controls is simple....set the potentiometer for maximum speaker output and the switch for maximum highs.

### CRUCIAL DETAILS

A hole is provided in the back cover for the speaker leads. Wrap some tape around the leads where they go through the back cover so that the back chamber will be as air tight as possible. A knot in the cord just inside the back cover will keep the cord from accidentally being yanked out. Make sure there are no extra screws or washers loose inside the cabinet and then put on the back cover board.

### BACK COVER SCREWS

Every screw must be in tightly if the Karlson is to perform correctly. More demonstrations have been ruined by someone leaving out some of the back screws than by any other cause.

SEPARATE TWEETERS

Although we do not recommend the use of separate woofers and tweeters we have had many very complimentary letters from Karlson owners who have mounted their tweeters on or under the matching shelf or who have used an external tweeter mounted on top of the Karlson Enclosure.

PLACEMENT OF THE ENCLOSURE

Naturally there will be a bit more bass response if the unit is placed in the corner of the room, but this is not necessary since the Karlson provides adequate coupling in the bass range regardless of where it is placed. In general, allow plenty of space in front of the enclosure. The uniform response area in front of the enclosure of at least 1200 will make it unnecessary to point the enclosure directly at the listener. Upside down or sideways use of the Karlson (particularly the plywood model) is alright if you keep in mind that the speaker is mounted in the enclosure at a 30° angle and thus is directive a bit in this upward angle. In normal use this characteristic reduces the amount of energy going into the floor (and the apartment below).

BALANCE

The best results are achieved when a good balance is maintained between the high, middle and low frequency ranges. Ordinarily, enough bass is obtained with this enclosure to eliminate the necessity for loudness compensation or bass boost. Be sensible, adjust the controls to meet the needs of the acoustic environment and speaker characteristics. Added bass will compensate for too much treble, and vice versa. Reduction of both highs and lows will accentuate the middle frequencies.

VIBRATING THE PICKUP

The bass coupling of the Karlson may make it necessary for you to insulate the record player with some soft padding to keep the tone arm from being vibrated by the speaker. It is also a good idea to check the moorings of pictures if you are going to use higher levels of listening.

CLEANING KARLSONITE

The Karlsonite finish may easily be cleaned with a damp cloth. Stubborn dirt may require a little ammonia. For a less glossy finish use a bit of paste wax on the Karlsonite. This results in a fine satin sheen.

IF YOUR KARLSON ENCLOSURE IS NOT TRULY OUTSTANDING AND EXCITING TO LISTEN TO THEN CHECK THE SPEAKER UNIT, SPEAKER SCREWS, BACK COVER SCREWS AND READ THE SECTION, "TROUBLE-SHOOTING THE KARLSON".

LOUDSPEAKER RECOMMENDATIONS

The Karlson Enclosure will make a startling improvement in the performance of almost any speaker. More and more sound dealers are following the lead of Hudson Radio and are installing banks of six, eight, or twelve Karlson Enclosures for the comparative demonstration of speakers. In this way every speaker is shown off to its best advantage.

**HIGH-END:** There are several factors to be considered in recommending speakers: bass response - high end - smoothness - price - manufacturers quality control - peaks - etc. Since all of these factors are involved it is pretty difficult to come right out and say flatly that thus-and-so speaker is the best. For instance, take the problem of the high-end..... the higher frequencies. Too much high-end results in harshness and stridency. Demonstrate this to yourself by turning down the bass boost control on a system and see how the stridency increases. This has been a major complaint of the audiophile with most of the available speakers. There are, of course, two solutions to this problem: decrease the high frequency power of the speaker or increase the bass response of the speaker. The Tannoy and the RCA LC-1A speakers take the first solution and have gotten many faithful adherents with the smooth results. These speakers should be placed in an enclosure where they will be able to directly radiate the highs and not get too much bass response.

**BASS RESPONSE:** The combined front and back loading of the Karlson affords good clean bass response with any of the coax type speakers or regular woofers. The 10" and 12" speakers should perform well to below 30 cycles, and may go down close to 16 cycles. 15" speakers frequently give good output down to 8 cycles. Any woofer will be tremendously improved if used in a Karlson. The bass end of the enclosure is somewhat better than you can achieve with a horn enclosure 30 feet long with a 12½ foot mouth. There are no comparisons possible with infinite baffles or bass-reflex baffles.

**TWO WAY SYSTEMS:**

Two and three way systems are now obsolete. The use of separated woofers and tweeters invariably results in phasing distortion, causing listener fatigue. This is one of the primary reasons why many women don't like high fidelity. In a side-by-side comparison of the Karlson Enclosure with a two-way system you will notice the "megaphone" effect very easily. This is due to the sound starting from two different sources at the same time and arriving at your ears out of phase. Heretofore it has been necessary to use two-way systems for full range reproduction since no one acoustical system would operate over the whole audio spectrum. The invention of the Karlson coupler has changed all that and made it possible to use coaxial speakers with a resultant "pointsource" phasing which results in a cleanliness and definition of tone approaching true stereophonic reproduction. Musicians immediately notice that they can easily follow any instrument in the orchestra and that they can hear every string of a violin or guitar. This to them is even more important than bass response, high-end, etc.



SPECIFICALLY:

It is honestly difficult to make specific recommendations as to the best speakers to use in the Karlson. One of the best measures of excellence is price though, and few speakers are priced either remarkably above or below their comparative performance level. If you invest in any of the reasonably good coaxial or triaxial speakers you will have good sound and will be entirely satisfied. Keep in mind that the less you pay for a speaker the greater will be the difference between that unit and other makes of similar price, thus it pays you more to do some listening to the various less expensive units to find which ones you can best live with.

The Ultimate: Though the Jensen G-610 is disappointing in many enclosures it undergoes a transformation when placed in the Karlson. It has beautiful clean smooth bass, extended highs that are brilliant and clean, and a balance overall that makes it stand out. The price, \$250, is awfully high, but I suppose it is necessary. The G-610 in a Karlson Enclosure can be considered a laboratory standard and should be of interest to labs, record reviewers, and others who must have the ultimate regardless of the cost.

Penultimate: It takes a pretty experienced listener and a lot of listening to make decisions among the top speakers. The Altec 604C (\$156) is capable of clean bright response with exceptional range in both the highs and lows, it has good efficiency and is recommended for heavy duty applications. The Stephens 206AX (\$122) has crisp highs, excellent lows, and high efficiency. It makes a good audiophile demonstration unit. We have used this speaker with great success at many of the audio shows. The Stromberg-Carlson RF-475 (\$180) has a smooth extended response with a good middle range and clean performance. It too is recommended for heavy duty applications. Other 15" speakers that we have not given such exhaustive lab tests or which have been recommended by dealers and customers repeatedly are the Jensen H530 (\$127), the Altec 602A (\$114), the Jensen H520 (\$78) and the Electro-Voice SP-15 (\$76). Recent tests with the Electro-Voice 15TRX (\$135) show that it has a clean crisp response with extended highs and lows and certainly is recommended for home systems.

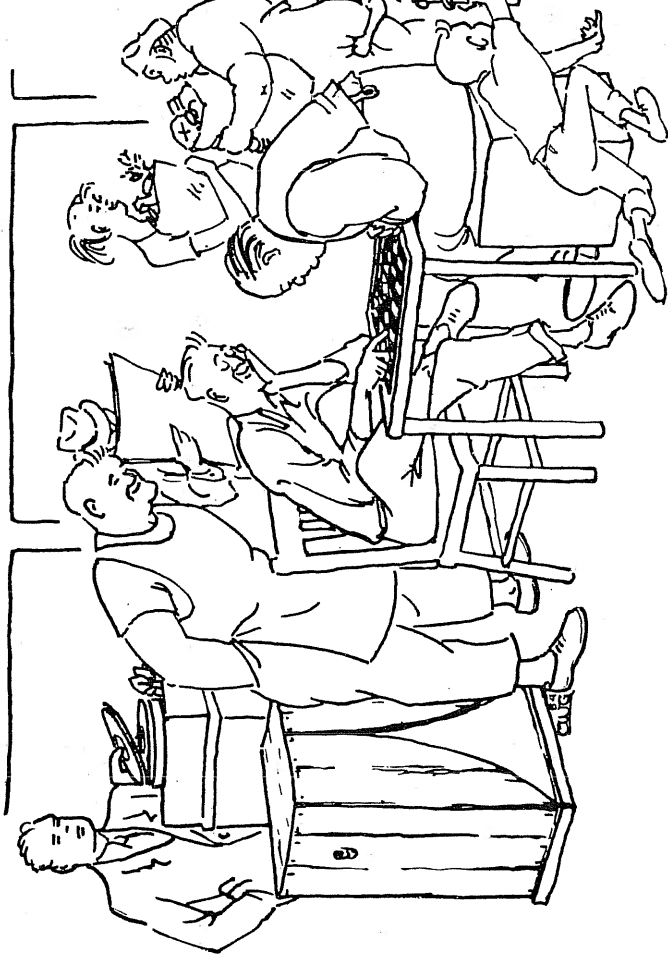
Twelve-inch Speakers: Due to the slightly different characteristics of the Karlson Ultra-Fidelity 15" speaker enclosure and the Karlsonette 12" speaker enclosure it will be better to make two sets of recommendations, one for each cabinet. The 15" enclosure, when fitted with a 12" adapting board, will give the best results with the Altec 601A (\$99), the Jensen H-222 (\$54), the Stephens 122AX (\$53) and the Electro-Voice 12TRX (\$114). The 12" Karlsonette enclosure is recommended for use with the Tannoy Dual-Concentric 12" speaker (\$130) which is silky smooth over the entire audible range and is fine for perfectionists and home systems. The Goodman Axiom 22 (\$72) is an excellent value for it has smooth extended response with exceptional bass and is recommended for general hi-fi use. The Electro-Voice 12TRX (\$114) is also fine for home systems for it has clean crisp response with extended highs and lows. The Stromberg-Carlson RF-471 (\$50) has a smooth response with very heavy bass and is especially

SPEAKER RECOMMENDATIONS.....CONT'D.

suited for spinet organs and similar applications. The 215 Hartley (\$65), though only a ten inch speaker, stands up to the 12" units rather well and has much to recommend it.

Others: One dealer was so taken with the performance of the Jim Lansing D-130 (\$70) in the Karlson that he called up long distance to tell us about it. Many customers have reported good satisfaction with the RCA-LC-1A 15" speaker, though we prefer speakers with a bit more brilliant highs. The University 6201 12" speaker (\$45) works well in the 15" Karlson but has not yet been tested in the Karlsonette. Ditto the Wharfedale 12/CS/AL 12" speaker (\$65).

Manufacturers: Most manufacturers are manic where their own products are concerned and considerable pressure has been brought to bear on us to tone down our speaker recommendations. Our mail indicates overwhelmingly that the consumer wants to know what to expect with various units in the Karlson Enclosure and that he cannot get this information from the speaker manufacturers. The foregoing recommendations were a bit painful in some instances since some of the manufacturers have been quite helpful and friendly while others have maintained attitudes ranging from indifference to hostility.



SCIENTIFIC AUDIENCE REACTION TESTS MADE ON EACH NEW MODEL

# KARLSON "12"

A NEW KARLSON FOR 12" SPEAKERS

**TWO FEET HIGH**

Only two feet high: 24-3/4" x 16-3/4" x 13-3/4". Weight about 35 pounds, portable.

Adjustable Brilliance so you can match the characteristics of the room....plus: Adjustable Speaker Damping to exactly match the speaker being used resulting in optimum transient response. It can be mounted in any position; has a separate base.

Plywood Kit with full finishing instructions.  
MODEL 12PK.....

**\$37.50**

Assembled Plywood unit with finishing instructions.  
MODEL 12PU.....

**\$55.50**

Mahogany or Blond Karlsonite finished units.  
MODEL 12M-12B..

**\$99.60**

## Comparison of 12" & 15" Karlson Enclosures

Both the 12" and the 15" Karlson Enclosures have about the same frequency responses. What then are the differences? Why use the larger unit at all? The answer is twofold. For one thing, the larger the unit, the greater the dynamic range and average sound level possible. For another, there are some better speakers made in the 15" size than in the 12" size.

Previously it was considered necessary to have enormous structures in order to achieve low frequency response. With the advanced techniques incorporated in the Karlson Enclosures, such a concept is now merely a fable. The extraordinarily high efficiencies of the Karlson Enclosures now make it possible both to have low frequency response and enormous dynamic range relative to the size of the units used.

The choice then would seem to be one of how far you intend to go with your music system. Many people invest in the 15" Karlson Enclosure and then, in order to gradually improve their system, put in a 12" speaker. Later on they go to one of the expensive 15" units, but in the meantime they have had good quality sound with a very inexpensive speaker.

In selecting the proper enclosure for your particular application, you should consider the relative volume at which you want to operate, and then select the proper enclosure. The Karlson 15 is for use in large rooms where tremendous dynamic range is desired, while the Karlson 12 is very nearly an all-purpose enclosure, designed to operate at more moderate sound levels.

In addition to these differences, it may be noticed that the large enclosure and speaker combination has a greater overall efficiency than the smaller unit. This is primarily due to the greater efficiency of the 15" speakers.

# OPERATING INSTRUCTIONS FOR THE KARLSON 12

## INSTALLATION OF THE SPEAKER

Coaxial Speakers with flared horn tweeters should be mounted with the flare in the vertical position, except for the Electro-Voice 12TRX and 12TRXB which should be mounted with the flare horizontal. In any case, do the opposite to that recommended by the speaker manufacturer. Controls dangled from the speaker or its cross-over network can be adjusted to the maximum position and left inside the cabinet. Tape them to the padding in the back so they won't rattle. If you MUST have an extra control to play with go ahead and drill a hole in the back or side of the cabinet.

## TUNING THE KARLSON 12 TO YOUR ROOM:

### BRILLIANCE CONTROL

Toward the top of the cabinet in the back you will find a removable panel, the port panel, which is held in place by some screws. This panel is shipped from the factory with the ridge toward the front of the cabinet, which is the adjustment for a normal living room. If your room is much livelier than normal, having considerable bare wall space and rug-less floors, this panel can be reversed to compensate. Be careful to keep the port spacing at 15/16" when changing the port panel.

## TUNING THE KARLSON 12 TO YOUR SPEAKER:

### DAMPING CONTROL

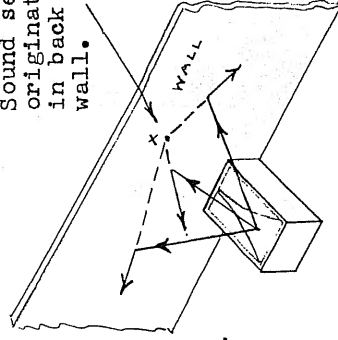
Those peculiar holes in the back cover are adjustments for the damping control strip. Essentially, the lower the resonant frequency of the speaker, the lower the strip should be mounted. A good rough rule for the adjustment is to put the strip in the top position when you are using an inexpensive speaker (under \$30), put it in the middle position with the medium priced speakers (to \$60), and in the lowest position with the more expensive speakers. Woofers should always be matched in the low position. Lower priced speakers with a power rating of over 20 watts will work better in the low position providing the power rating was earned in the laboratory and not in the advertising department.

## Aural-Optics

THE KARLSON TWELVE MAKES THE WALL AURALLY INVISIBLE!

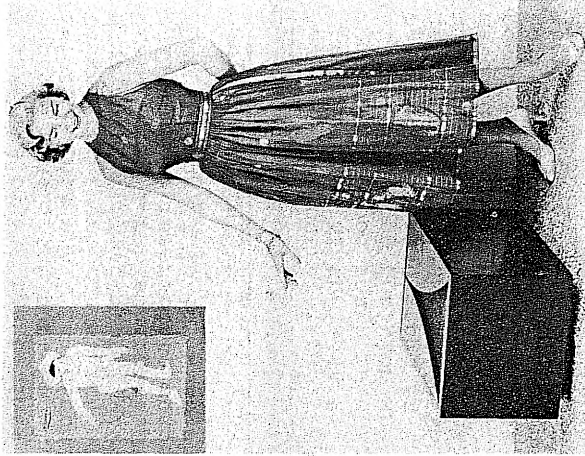
Sound is reflected from a wall in the same manner that light is reflected by a mirror. A virtual sound image is similarly formed beyond the wall when the sound waves are properly directed against it with the Karlson Twelve.

Sound seems to originate here in back of the wall.

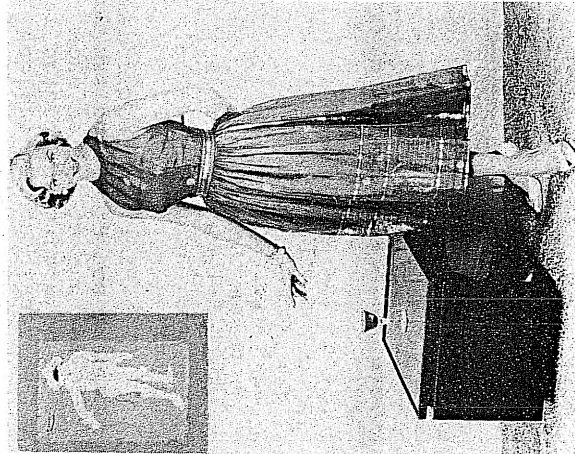


# KARLSON "12"

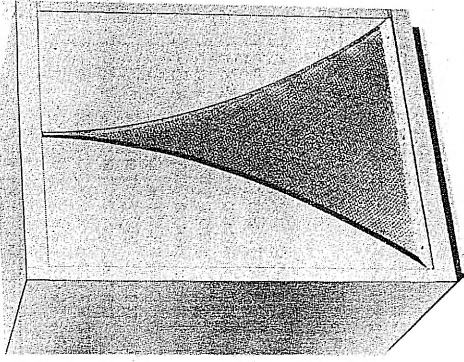
See how small the Karlson 12 actually is? Hard to believe, isn't it? The giant-sized gal our photographer used in the pictures makes it even more convincing, eh? Well, actually the height of the enclosure is 24½" plus the 2½" of the base. The base is separate so you can do without it if you wish. Local option.



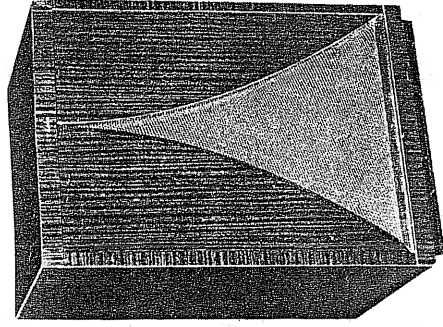
The Karlson 12 may be mounted in any position your heart desires. For the most astounding results you might try this lying down approach. This is the way we demonstrated at the audio shows which created such a sensation by making the music seem to come right out of the blank wall of the room.



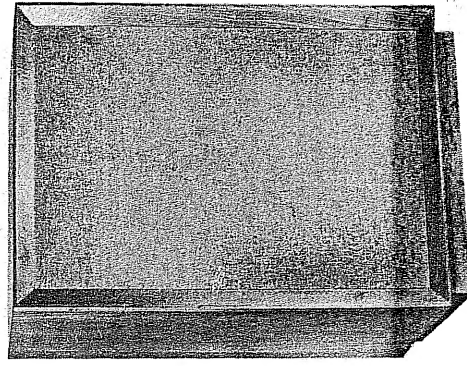
The greatest little-old wife convincer yet discovered. For only \$14.95 extra you can get this beautiful Karlsonite protected serving tray which converts the hi-fi enclosure into a musical coffee table. Shrewd eh? This destroys the wife's last feeble excuse for you not to have a hi-fi speaker in the living room. The enclosure takes up very little space in the room and makes a very handy table when you have company.



MAHOGANY, MODEL 15M



BLONDE, MODEL 15B



PLYWOOD, MODEL 15PU

FULL GRILLE DESIGN